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Office of Toxic Substances
Environmental Protection Agency
401 M. Street SW
Washington, DC 20460

Dear Sir:

With this letter, Northrop Corp[illegible] submits to the Environmental Protection Agency copies of studies which meet t[illegible]equirement of Section 8(d) of the Toxic Substances Control Act. A list of the enclosed studies, is attached. For each study, the Section 8(d) listed chemical that is processed by Northrop is indicated.

If you have any questions, please contact the undersigned.

Jacquelyn A. Luca

Jacquelyn A. Luca
Director, Corporate
Occupational Health
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ATTACHMENT 1

Name of Study	Sec. 8(d) listed chemical that that is processed	CAS Number
o Health Risk Assessment for Anaheim (Y-12) facility Northrop Corporation Aircraft Division	1,1,1 - Trichloroethane m-Xylene	71-55-6 108-38-3
o Health Risk Assessment for the East Complex facility Northrop Corporation Aircraft Division	1,1,1 - Trichloroethane Methylene chloride Toluene Ethlene, tetrachloro- m-Xylene	71-55-6 75-09-2 108-88-3 127-18-4 108-38-3
o Health Risk Assessment for Hawthorne (AE/AF/AG) facility Northrop Corporation Aircraft Division	1,1,1 - Trichloroethane Methylene chloride Toluene	71-55-6 75-09-2 108-88-3
o Health Risk Assessment for the West Complex facility Northrop Corporation Aircraft Division	1,1,1 - Trichloroethane Methylene chloride Toluene	71-55-6 75-09-2 108-88-3

Name of Study	Sec. 8(d) listed Chemical that is processed	CAS Number
o Health Risk Assessment for the AB2588 Air Toxics Information and Assessment Act of 1987 for Northrop Corporation B-2 Division - Pico Rivera, CA	1,1,1 - Trichloroethane Benzenamine, 4,4'-methylenebis- Benzene, 2, 4 - diisocyanato -1- methyl-	71-55-6 101-77-9 584-84-9
o Site Characterization and Evaluation of Cleanup Alternatives for Northrop Corporation Ventura Division	1,1,1 - Trichloroethane Methylene chloride Methyl ethyl ketone Toluene	71-55-6 75-09-2 78-93-3 108-88-3
o Evaluation and Impact of California's Safe Drinking Water and Toxic Enforcement Act of 1986 for Northrop Corporation	Oxirane, (chloromethyl)-	106-89-8
o Evaluation of Impacts Resulting from the South Coast Air Quality Management District Proposed Rules 1401 and 223 for Northrop Corporation	Ethene, tetrachloro-	127-18-4
o Health Risk Assessment for Vapor Emissions from the Remediated Northrop Electronics Systems Facility Former Anodic Room Area Prepared for Northrop Corporation Electronic Systems Division	1,1,1 - Trichloroethane	71-55-6

HEALTH RISK ASSESSMENT

IN FULFILLMENT OF REQUIREMENTS UNDER THE

AB2588 AIR TOXICS INFORMATION AND ASSESSMENT ACT OF 1987

Northrop B-2 Division
Pico Rivera, CA

Prepared by:

3E Company
Environmental and Ecological Engineering
Solana Beach, CA

TABLE OF CONTENTS

1.0 Executive Summary

This report contains results of a health risk assessment performed by the B-2 Division of the Northrop Corporation for the Pico Rivera facility located at 8900 East Washington Blvd. The report is complex and may be confusing because risk assessments are, by nature, very technical with many components from various scientific disciplines. Therefore, results and methodologies are summarized according to questions and issues which typically arise when risk assessments are reviewed and discussed.

214-1

What is a Health Risk Assessment?

A health risk assessment (HRA) is essentially a tool used by government agencies for regulatory decisions. In the field of air pollution control, HRA's are usually performed to characterize potential impacts from certain types of air contaminants. The HRA may be broad to address impacts from a group of sources (i.e. benzene emissions from automobiles), or the HRA may focus on air contaminants emitted from a specific process or facility. Results of the HRA are then reviewed by responsible agencies, in this case the Department of Health Services and the South Coast Air Quality Management District (SCAQMD), to determine if additional regulatory action is warranted.

There are two important factors considered in any HRA: the hazard or toxicity of a chemical and the likelihood that exposure to the chemical will be sufficient to exceed an established safety threshold. In other words, there is

no direct relationship between the presence of a chemical and a health hazard. An HRA of air contaminants must consider the amount of a given chemical, the manner in which it is released to the atmosphere, meteorological conditions affecting dispersion and the location and number of exposed persons.

Why did Northrop prepare the risk assessment?

Northrop is one of several thousand facilities participating in a state wide program known as the AB2588 Air Toxics Assessment and Information Act of 1987. The objective of the AB2588 program is to obtain a comprehensive inventory of chemicals used in various facilities and determine if there are routine emissions to the atmosphere. Facilities in the program include large manufacturing facilities such as refineries and food processors as well as relatively small operations such as dry cleaners and retail gasoline stations. The AB2588 program, generally considered the most complex and comprehensive inventory effort ever performed for one entire state is administered by the California Air Resources Board, California State Department of Health Services, and local air pollution control agencies like the SCAQMD.

Under the AB2588 program, the SCAQMD required certain facilities to perform a health risk assessment (HRA). Facilities were selected using a scoring system that considered the types and amounts of inventoried emissions for 1989. Northrop was one of several hundred companies in the Los Angeles basin required to complete an HRA.

What is a Toxic Air Contaminant?

Section 39655 of the California Air Pollution Control laws defines a toxic air contaminant as "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, which may pose a present or potential hazard to human health." This broad definition can include a multitude of chemical compounds. The AB2588 program specifies approximately five hundred compounds to be studied including some familiar contaminants like gasoline vapors, tobacco smoke. ammonia and mineral oils.

What causes this type of air pollution?

Northrop B-2 Division manufacturers aerospace components at the Pico Rivera facility. Producing modern airplanes requires many complex manufacturing techniques and specialized materials of construction. Many operations have no emissions to the atmosphere. However, air pollution is an unavoidable consequence of certain manufacturing and fabrication processes.

Almost all facility emissions are associated with surface coating and cleaning operations where paints and solvents are applied to components. Paints are either sprayed or applied by hand. Emissions occur directly during the spraying of paints and evaporation of solvents as the paints dry.
Indirect emissions also occur when surfaces are cleaned prior to painting, as paints and epoxies are mixed and during equipment cleanup. Almost all surface coating emissions are in the vapor or gaseous form.

Other sources of emissions include natural gas combustion in space heaters, steam boilers, ovens and electrical generators.

All emissions from the facility are below levels established in the SCAQMD Rules and Regulations.

Can these emissions be reduced?

Northrop has expended substantial research and development and financial resources and made great strides in recent years to reduce air pollution. Northrop's program for reducing emissions focuses on reducing usage of materials containing potential pollutants. Emission control devices including the most innovative technologies are used on many processes to reduce emissions to the atmosphere. Where physical constraints prohibit containment, the approach changes to usage reductions or product reformulations. However, certain changes that could further reduce emissions are beyond Northrop's control because of strict product and performance specifications inherent in aerospace materials for which there are no current substitutes.

Northrop has an ongoing research and development program committed to evaluating all materials, facilities and operations to determine if emissions can be reduced. For instance, upgrades in coating application equipment will improve coating efficiency and reduce coating usage and hence emissions in 1991. Northrop will continue to make every reasonable effort to reduce emissions but it is unlikely that emissions can be eliminated entirely from aerospace manufacturing operations.

Who determined the procedures for performing the health risk assessment?

Northrop was required to perform the HRA according to procedures adopted by the SCAQMD. These procedures are designed to ensure that the maximum potential impacts to the public are calculated in a uniform manner.

Northrop prepared risk assessment and dispersion modeling protocols detailing the risk assessment approach. The protocol was submitted to the SCAQMD for approval and is included in Appendix D.

214-1

How can one interpret the results of a Health Risk Assessment?

Results of a HRA must be carefully reviewed prior to formulating any specific conclusions regarding potential adverse impacts. Perhaps the most important consideration in interpreting results is the uncertainty inherent in each step of the risk assessment process. The uncertainty stems primarily from the absence of measurement and scientific data. This necessitates the use of assumptions. For instance, toxicity data for a given chemical, or group of chemicals, may be based on studies performed on laboratory animals. These results are then applied to humans to establish acceptable exposure levels. Assumptions used to transfer animal toxicity and exposure data to humans are appropriately designed to be protective of the public health. One very conservative assumption is made when calculating maximum possible risk. For AB2588 risk assessments it is assumed that an individual is exposed to the highest concentration for 24 hours/day, 365 days/year for seventy years even though Northrop is primarily a first shift and five days per week operation with facility startup in 1984. The uncertainty or possible error associated with this conservative approach is obvious.

While protection of the public health is of paramount concern, the uncertainty and large safety margins inherent to the risk assessment must be taken into consideration when reviewing any results. Perhaps the most useful application of a risk assessment is to look at general trends for a given facility or area. For example, results of the assessment could identify that the majority of potential risk is associated with a given process or type of equipment and the facility should consider an air pollution control device or product reformulation. A regulatory agency also may review results for several facilities located in a given area and decide that one or more facilities should initiate emission reduction programs.

Is there an acceptable level of health risk?

No acceptable risk levels have as of yet been established for the AB2588 program. The SCAQMD has established allowable levels of cancer risk for new sources of certain toxic air contaminants.

Everyone including the public, industry and regulatory agencies is concerned about a healthy environment and would like to eliminate any potential health risk. Unfortunately, some amount of air pollution is expected and it is unlikely there will be "zero" risk in an urban setting for the foreseeable future.

What are the results of the risk assessment?

There are many parameters and assumptions that should be considered when reviewing the risk estimates. Exposure duration is an important parameter. The estimates of excess cancer risk were calculated under three exposure scenarios.

* **Most Reasonable Exposure** - This scenario is evaluated to provide an exposure estimate familiar to most individuals. This scenario accounts for the mobility of residents and workers in contemporary urban populations. The most reasonable residential exposure is a 17 hr/day, 365 days/year, 9 year exposure to ambient concentrations. For the most reasonable offsite worker/occupational exposure, an exposure period of 9 hrs/day, 260 days/year, for 9 years is assumed.

* **Maximum Plausible Exposure** - This scenario is evaluated to provide a conservative (health protective) estimate of maximum potential exposure. Maximum plausible residential exposure is a continuous exposure to receptor specific pollutant concentration over 30 years. For the maximum plausible offsite worker/occupational exposure, an exposure period of 9 hrs/day, 260 days/year, for 30 years is assumed.

* **Maximum Possible Exposure (MPE)** - The MPE is a hypothetical exposure scenario where an individual is continuously exposed to the highest off site annual average pollutant concentrations. For a residential MPE, a 70 year exposure period of 24 hrs/day, 365 days/year is assumed. For offsite worker/occupational MPE, a 40 year exposure period of 9 hours/day, 260 days/year is assumed.

It is acknowledged that the MPE exposure is very unrealistic and will overestimate any potential exposure to facility emissions. However, the MPE risk estimate, which is analogous to the widely used maximum exposed individual scenario, is required by the Department of Health Services and may be useful when comparing the relative potential health risks posed by various types of facilities throughout the state. The MPE exposure scenario is also specified in the CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines.

214-1

Risks from chemicals suspected to cause cancer in animals or humans are known as "excess cancer risks". These risks are expressed as probabilities that one may contract a disease because of exposure to a given chemical. Probability is expressed on a scale of zero to one, with zero probability representing no chance of disease.

The probability of contracting a disease or excess cancer is usually very small. For instance, an excess cancer risk value of 0.00001 indicates one chance in one hundred thousand. Potential excess cancer risks are presented in Table 1.

Potential non-carcinogenic risks were also calculated and are presented in Table 2. Noncancer risks are expressed as health hazard indices. Health hazard indices are not probabilities. The hazard index of a given chemical is the ratio of the potential intake of a chemical to the acceptable exposure limit (AEL) established by the Department of Health Services. AEL's are applicable to all members of the public including children or infirmed individuals.

Table 1 - Risk Assessment Results
At Location Of Maximum Impact
Potential Excess Cancer Risk

Exposure Scenario	Potential Excess Cancer Risk (x10-5)
Most Reasonable Residential Exposure	0.8
Maximum Plausible Residential Exposure	3.3
Maximum Possible Residential Exposure	9.2
Most Reasonable Occupational Exposure	0.25
Maximum Plausible Occupational Exposure	0.85
Maximum Possible Occupational Exposure	1.2

Includes chromium emissions from painting operations. Further information regarding the bioavailability of these emissions is expected from the DHS in the near future. Potential Carcinogenic risk from these emissions is 99 percent of total risk

CV - cardiovascular system; CNS - central nervous system; IMMUN - immune system; KIDN - kidney; GI/LV - gastrointestinal system and liver; RESP - respiratory system; REPRO - reproductive system including teratogenic and developmental effect.

The above risk estimates are for the maximum impact point which is adjacent to the facility. Average risk values for residents in the study area are given in Table 13.

Table 2 - Risk Assessment Results
At Location Of Maximum Impact
Potential Noncancer Impacts

Exposure Scenario	Health Hazard Index Potential Acute Noncancer Impacts		Health Hazard Index Potential Chronic Noncancer Impacts						
	Formaldehyde	Lead	CV	CNS	IMMUN	KIDN	GI/LV	REPRO	RESP
Maximum Possible Residential Exposure	2.3	0.03	<0.01	0.01689	0.3846	0.4208	0.1415	<0.01	0.4208

CV - cardiovascular system; CNS - central nervous system; IMMUN - immune system;
KIDN - kidney; GI/LV - gastrointestinal system and liver; RESP - respiratory system;
REPRO - reproductive system including teratogenic and developmental effect.

Hazard indices have been calculated under two exposure scenarios: chronic or long-term exposure to average concentrations and acute or short-term exposure to the maximum one-hour concentrations. Hazard indices for chronic exposure are calculated separately depending on what parts of the body may be affected.

What will happen next?

The SCAQMD and the Department of Health Services will review the risk assessment to ensure that specified procedures have been followed and results are complete. Eventually, all AB2588 risk assessments must be approved by the SCAQMD.

Risk assessment results from all facilities will be presented in an annual report prepared by the SCAQMD. Although no criteria has been established, some facilities may be required to provide specific public notification of the risk assessment results.

Upon review of the results, the SCAQMD or Air Resources Board may determine that additional regulations are necessary for certain chemicals or processes. Also, the SCAQMD may decide that specific facilities should change their operations to reduce potential public exposure to toxic air contaminants. Northrop intends to continue it's decade-long commitment to developing effective methods for minimizing impacts to the environment.

2.0 Facility Description

This section provides a description of the Northrop B-2 facility, types of emitting processes, and surrounding land uses.

2.1 Site Description

The Northrop B-2 Division manufactures many aerospace related products. The Pico Rivera facility consists of approximately 35 buildings on 200 acres. The facility property line is defined by Paramount Blvd. to the West, Washington Blvd. to the North, Rosemead Blvd. to the East, and the Southern Pacific rail tracks to the South. Figure 1 shows the building configurations at the facility. The locations and descriptions of emitting processes are reported in the AB2588 Emission Inventory Plan and Report. All processes are permanently sited and operated at the indicated locations.

The facility is located on flat terrain with only slight (several feet), gradual changes in elevations. The general proximity of the facility is shown in Figure 2; a complete map showing detailed terrain features in the study area is provided with the modeling results in Appendix F. The nearest geological formation with an elevation higher than the facility (160 feet above sea level) is approximately 3.0 miles to the northeast. The highest stack is approximately 90 feet, located on building 108 (subdivision of building 101) which is 84 feet high.

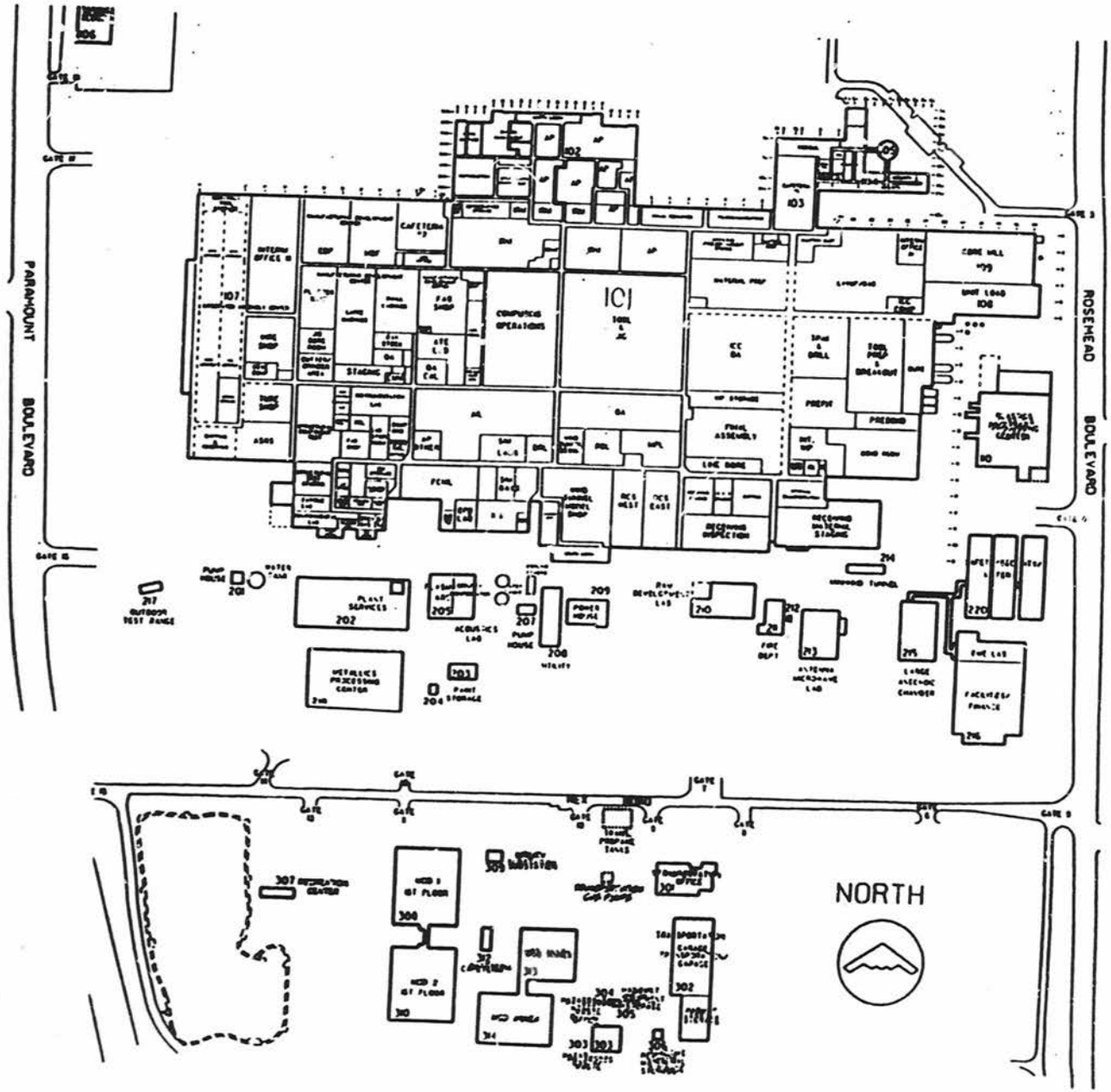

FIGURE 1
BUILDING CONFIGURATION
NORTHROP B-2 DIVISION

2.2 Source Description

The Pico Rivera facility performs a wide variety of manufacturing processes. Almost all the processes are typical for a manufacturing facility and are described in detail in the AB2588 Emission Inventory Plan and Report. Emissions are released to the atmosphere through dedicated exhaust stacks or ventilation air handling systems. A list of emission points and processes are presented in Table 3.

Approximately 226 processes or devices were identified under the AB2588 program. Many "devices" were actually work stations where minor painting, suface cleaning or general maintenance is performed. Of these devices, approximately 112 processes or devices were not operated or had no AB2588 emissions in the inventory year of 1989.

2.3 Area Description

The Pico Rivera facility is located in an urban area with both residential and commercial land uses. A map showing the facility proximity is presented in Figure 2.

Land uses immediately north, east and south of the facility are mainly residential with some commercial facilities. Commercial facilities are located immediately west of the facility. A large concentration of industrial facilities is located approximately 2 miles west/northwest in the City of Commerce.

Table 3A
NORTHROP STACK AND EMISSION ALLOCATION INFORMATION

Stack Number Fugitive Number	Associated Devices	Building Number	Comments
93001	72001 72192	101	Anodizing Line
93002	72191 72193	101	Anodizing Line
93004	71032	101	Degreaser
93006	71059 72041 72042 72049 72386 72411	101	Paint Booth
93011	71007	101	Autoclave
93012	71008	101	Autoclave
93013	71010 '404	101	Autoclave
93014	7 .009	101	Autoclave
93015	72006	101	Boiler
93016	72007	101	Boiler
93017	72008	101	Boiler
93018	72009	101	Boiler
93019	72010	101	Boiler
93020	72011	101	Boiler
93021	72012	101	Boiler
93022	72013	101	Boiler
93023	72014	101	Boiler
93024	72015	101	Boiler
93025	72016	101	Boiler
93026	72017	101	Boiler
93027	72018	101	Boiler
93031	72028	101	Boiler
93033	72020	101	Boiler
93036	72023	101	Boiler
93037	72024	101	Boiler
93038	71014	101	Boiler
93039	71015 72424	101	Booth
93040	71016	101	Booth

Table 3A
NORTHROP STACK AND EMISSION ALLOCATION INFORMATION

Stack Number Fugitive Number	Associated Devices	Building Number	Comments
93041	71017 72372	101	Booth
93042	71018	101	Booth
93043	71024	110	Booth
93044	71025	110	Booth
93045	71026	110	Booth
93050	71060	101	Degreaser
93053/NT053FUG	71056 72361 72362 72369 72370 72425	107	Degreaser
93088	71044	101	Oven
93089	71045	101	Oven
93090	71046	101	Oven
93091	71047	101	Oven
93092	71048	101	Oven
93093	71049	109	Oven
93094	71050	110	Oven
93095	71051	110	Oven
93096	71052	110	Oven
93097	71061	210	Oven
93098	71054	210	Oven
93227	72209 72400	218	Anodizer
93332	72056	208	Internal Combustion Engine
93333	72055	201	Internal Combustion Engine
93385	71040	209	Internal Combustion Engine
93386	71041	209	Internal Combustion Engine
93387	71042	209	Internal Combustion Engine
93388	71043	209	Internal Combustion Engine
93392	72208 72422	102	Blueprint Machine
93394	71062	101	Hood
93420	71019	101	Spray Booth
93421	71020	101	Spray Booth

Table 3A
NORTHROP STACK AND EMISSION ALLOCATION INFORMATION

Stack Number Fugitive Number	Associated Devices	Building Number	Comments
93500	71027 [illegible]6	210	Spray Booth
93501	71[illegible]	210	Spray Booth
93505	7107[illegible]	101	Combustion Testing
93506	71057	218	Spray Booth
93507	71021	102	Spray Booth
93508	72427	101	Hood
93509	72428	101	Hood
71034	71036	301	Fuel Dispenser
71064 / NTCRMFUG	71064	109	Area Source
72037 / NTDDLFUG	72380	210	Flow Coater
72212 / NTTMPFUG	72212	101	Etch
72288 / NTEMEFUG	72288	217	Area Source
72306 / NTPLASF	72367	101	Area Source
72364 / NTGP2FUG	72389 72426 72365	101 101 101	Area Sources
72371 / NTPLSTF	72371	101	Area Source
72373 / NTMDCFUG	72374 72375 72376A 72401 72406	101	Area Sources
72379 NTQAFUG	72379	101	Area Source
72385 NTSHPFUG	72419	101	Area Source
72390 / NTENVFUG	72390	101	Area Source
72391 / NTIELFUG	72391	101	Area Source
72392 / NTCHLFUG	72392	101	Area Source
72393 / NTVIBFUG	72393	101	Area Source
72395 / NTFLTFUG	72368	101	Area Source
72396 / ICCFUG	72397 72398 72399 72405 72412 72413 72414	101	Area Sources

Table 3A
NORTHROP STACK AND EMISSION ALLOCATION INFORMATION

Stack Number Fugitive Number	Associated Devices	Building Number	Comments
	72415 72417 72420 72421 72423		
72408 / NTQATFUG	72408	101	Area Source
72410 / NTEWSFUG	72410	101	Area Source
72416 / NTAVAFUG	72416	101	Area Source
72418 / NTHIBFUG	72418	101	Area Source
72419	72419	101	Area Source

TABLE 3B
NORTHROP DEVICES WITH NO REPORTED OPERATIONS OR AB2588 EMISSIONS FOR 1989

71001	Anodizer	Bldg. 213	Etch Room
71002	Dip Tank	Bldg. 218	Penetrant
71004	Area Source	Bldg. 218	MPC
71005	Area Source	Bldg. 218	MPC
71006	Area Source	Bldg. 218	MPC Col. 1
71029	Spray Booth	Bldg. 210	Dip Room
71031	Storage Tank	Bldg. 301	Transport.
71035*	Degreaser	Bldg. 218	MPC Lab.
71037	Flow Coater	Bldg. 210	Dip Room
71039	Hood	Bldg. 210	Dip Room
71055	Oven	Bldg. 210	High Bay
71065	Area Source	Bldg. 109	MEK 1365-1
71070	Hood	Bldg. 101	RDL
71187	Storage Tank	Bldg. 208	Pumphouse
71202	Oven	Bldg. 101	Simulation
72002	Autoclave	Bldg. 101	Composites
72003	Autoclave	Bldg. 101	Composites
72003a	Hood	Bldg. 101	Composites
72004	Autoclave	Bldg. 101	Composites
72005	Autoclave	Bldg. 101	Composites
72019	Boiler	Bldg. 110	East Center
72021	Boiler	Bldg. 110	East Center
72022	Boiler	Bldg. 110	Silicone
72025	Hood	Bldg. 101	QA Chem Lab
72026	Hood	Bldg. 101	M&P Environment
72027	Hood	Bldg. 101	Composites
72028a	Hood	Bldg. 101	M&P Metal
72030a	Hood	Bldg. 101	M&P Thermal
72031	Area Source	Bldg. 101	Flight Sim.
72031a	Hood	Bldg. 101	M&P Paint
72032	Hood	Bldg. 101	M&P Chromat.
72032a	Blueline Machine	Bldg. 101	Blueline South
72033a	Hood	Bldg. 218	Dye Penetrant
72034	Hood	Bldg. 210	C-Van Storage
72034a	Hood	Bldg. 101	Composites
72035a	Hood	Bldg. 101	M&P Surfacing
72036	Soldering	Bldg. 101	Flight Sim.
72036a	Hood	Bldg. 101	M&P Sim.

*This degreaser was dismantled and removed in 1990.

TABLE 3B
NORTHROP DEVICES WITH NO REPORTED OPERATIONS OR AB2588 EMISSIONS FOR 1989

72037a	Hood	Bldg. 101	M&P Thermal
72038a	Soldering	Bldg. 101	M&P Mechan.
72039	Solder	Bldg. 101	Instrument
72039a	Hood	Bldg. 101	M&P Thermal
72040	Soldering	Bldg. 101	Electrical
72040a	Hood	Bldg. 101	M&P Thermal
72041a	Hood	Bldg. 101	M&P Wet Chem.
72042a	Hood	Bldg. 101	M&P Wet Chem.
72043	Soldering	Bldg. 101	Elec Techs
72043a	Hood	Bldg. 101	M&P Spectr.
72044a	Hood	Bldg. 101	M&P Thermal
72045	Vehicles	Bldg. 101	MDC Machin.
72045a	Hood	Bldg. 101	M&P Surfac.
72046	Vehicles	Bldg. 101	M&P Surfac.
72046a	Hood	Bldg. 101	M&P Surfac.
72047	Vehicles	Bldg. 101	Tool Fab.
72047a	Hood	Bldg. 101	M&P Surfac.
72048	Vehicles	Bldg.101	MDC Large
72049	Welding	Bldg. 101	Structures
72050	Hood	Bldg. 101	RDL
72051	Hood	Bldg. 101	RDL
72052	Hood	Bldg. 101	RDL
72053	Hood	Bldg. 101	RDL
72054	Hood	Bldg. 101	Single Bypass
72062	Space Heater	Bldg. 101	QA Environment
72063	Space Heater	Bldg. 101	QA Environment
72065	Space Heater	Bldg. 101	R&D Metal
72067	Space Heater	Bldg. 101	R&D Labs
72068	Space Heater	Bldg. 101	Conference
72071	Space Heater	Bldg. 101	M&P Clean NA
72113	Space Heater	Bldg. 101	Avionics
72116	Space Heater	Bldg. 101	Avionics L
72119	Space Heater	Bldg. 101	Audio Visual
72123	Space Heater	Bldg. 101	Avionics L
72124	Space Heater	Bldg. 101	Wind Tunnel
72129	Space Heater	Bldg. 101	Wind Tunnel
72130	Space Heater	Bldg. 101	Large Scale
72131	Space Heater	Bldg. 101	Small Scale
72135	Space Heater	Bldg. 101	New Package
72136	Space Heater	Bldg. 101	Wind Tunnel
72141	Space Heater	Bldg. 101	ICC Lay up

TABLE 3B
NORTHROP DEVICES WITH NO REPORTED OPERATIONS OR AB2588 EMISSIONS FOR 1989

72142	Space Heater	Bldg. 101	East Man T
72160	Space Heater	Bldg. 101	ICC Machine
72167	Space Heater	Bldg. 101	Data Conc.
72177	Space Heater	Bldg. 101	QA R&D Lab
72192	Anodizer	Bldg. 101	M&P Surfac.
72204	Etch	Bldg. 101	Fab/Machin.
72205	Autoclave	Bldg. 101	RDL
72206	Dispenser	Bldg. 301	Transportation
72207	Blueline	Bldg. 101	Blue Print
72208	Blueline	Bldg. 210	AP Core Graphics
72210	Blueline	Bldg. 216	Blue Print
72211	Hood	Bleg. 101	M&P Paint
72213	Hood	Bldg. 101	QA Chem Lab.
72214	Blueprint Machine	Bldg. 101	Blue Print
72215	Anodizer	Bldg. 218	MPC
72218	Oven	Bldg. 218	MPC
72219	Hood	Bldg. 101	QA Emiss.
72220	Hood	Bldg. 101	QA Chem Lab.
72223	Hood	Bldg. 101	M&P Polymer
72225	Area Source	Bldg. 101	Data Reduc.
72323	Space Heater	Bldg. 202	Electrical NA
72336	Space Heater	Bldg. 101	CAD\CAM Room
72337	Space Heater	Bldg. 101	Computer Room
72338	Space Heater	Bldg. 101	Computer Room
72339	Space Heater	Bldg. 101	Repographics
72378	Area Source	Bldg. 101	ILS Lab.
72381	Welding	Bldg. 101	MDC Weld S.
72382	Welding	Bldg. 205	Plasma Arc
72383	Welding	Bldg. 218	218 Bldg. W.
72384	Welding	Bldg. 101	Cuf/Bof St.
72387	Area Source	Bldg. 101	RDL
72394	Area Source	Bldg. 101	Wind Tunnel
72409	Area Source	Bldg. 101	QA Develop.

Communities in the study area are well established. Census tract information indicates that there will be little change in population over the next two decades.

3.0 Hazard Identification

Hazard identification is a qualitative study of chemical and biological information to determine if exposure to a given pollutant may cause adverse health impacts. Sources of information include animal studies, controlled epidemiological investigations, and clinical studies or case reports.

Once a potential hazard is identified, a quantitative study is performed to determine the relationship between exposure, dose and adverse impacts. This study, known as a Dose-Response Assessment, results in a probability estimate of incidence or a threshold level below which no adverse health effect is expected. Effects on humans are generally estimated from experimental animal studies using mathematical models. This approach is generally accepted in the scientific community although there is considerable concern over the uncertainty associated with extrapolating data from animal studies to humans.

Health effect thresholds and dose response values for AB2588 risk assessments are specified by the State Department of Health Services (DHS) in the Air Toxics "Hot Spots" Program Risk Assessment Guidelines, January 1991. Use of the DHS health values is also required by the SCAQMD Supplemental Guidelines for Preparing Risk Assessments to comply with the Air Toxics "Hot Spots" Information and Assessment Act of 1987. Accordingly, Northrop used only DHS health values in the risk assessment.

The DHS health values are established to be protective of public health and to ensure that a risk assessment will not underestimate any potential risk. All potency and threshold values used in this risk assessment are specified by the Department of Health Services. The following is a brief description of potential hazards associated with chemicals subject to the refined risk assessment. (Source: Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Edition, Sittig).

Arsenic	A carcinogen emitted from liquid fuel combustion. Exposure through inhalation and ingestion of dust or fumes. Unit risk factor (URF) of 3.3×10^{-3}. Acute acceptable exposure limit (AEL): none. Chronic AEL: pending.
Benzene	A carcinogen emitted from fuel combustion, fuel storage, surface coating operations and atmospheric chambers. Exposure through inhalation of vapors or ingestion of contaminated media. URF of 2.9×10^{-5}. Acute AEL: none. Effects from chronic exposure may include irritation to eyes, skin, and upper respiratory tract. Chronic AEL: 71 ug/m^3.
1,3 Butadiene	A probable carcinogen emitted from liquid fuel combustion. Exposure through inhalation of gas or vapors or skin contact. URF of 2.8×10^{-4}. Acute AEL: none. Chronic AEL: none.
Hexavalent Chromium	A carcinogen emitted from liquid fuel combustion, surface coating operations, and metal finishing operations. Exposure through inhalation, ingestion, and

	dermal contact of dust or fumes. URF of 0.14. Acute AEL: none. Effects from chronic exposures include mucus irritation, dermatitis, and respiratory sensitization. Chronic AEL: 0.005 mg/kg/day.
1,4 Dioxane	A probable carcinogen emitted from surface cleaning operations where it is used as a thermal stabilizer. Exposure through inhalation, ingestion and eye and skin contact. URF of 7.7×10^{-6}. Acute AEL: none. Chronic AEL: none.
Formaldehyde	A probable carcinogen emitted from fuel combustion and resin fabrication operations. Exposure through inhalation and dermal absorption. URF of 1.3×10^{-5}. Acute exposure to high concentrations may cause irritation to mucus membranes of the respiratory tract and eyes. Acute AEL: 370 ug/m^3. Chronic exposure may cause dermatitis. Chronic AEL: 3.6 ug/m^3.
Isocyanates	A suspected carcinogen emitted from surface coating and epoxy fabrication operations. Exposure through inhalation of vapor, ingestion and eye and skin contact. Screening URF of 1.0×10^{-5}. Acute AEL: none. Chronic exposure may result in irritation of eyes, respiratory tract and skin. Chronic AEL: 0.095 ug/m^3.
Methyl Chloroform	A noncarcinogen emitted from surface coating and cleaning operations. Exposure through vapor inhalation. Acute AEL: none. Chronic exposure may cause skin and eye irritation. Chronic AEL: 320 ug/m^3.
4,4 Methylene Dianiline	A probable carcinogen emitted from resin fabrication operations. Exposure through vapor inhalation. URF of 1.5×10^{-5}. Acute AEL: none. Chronic AEL: none.

Lead Compounds	A suspected carcinogen emitted from metal application processes, liquid fuel combustion, and surface coating operations. Exposure through fume inhalation and ingestion. Screening URF of 8.0×10^{-6}. Acute exposure to high concentrations may affect the central nervous system. Acute AEL: of 1.5 ug/m^3. Chronic exposure may cause harm to internal systems including the kidneys, gastrointestinal system, central nervous system, blood and gingival tissue. Chronic AEL: 1.5 ug/m^3.
Nickel Compounds	A carcinogen emitted from metal application operations and fuel combustion. Exposure through inhalation and ingestion of dust fumes. URF of 2.4×10^{-4}. Acute AEL: none. Chronic exposure may cause irritation to the skin, eyes and mucus membranes of the upper respiratory tract. Chronic AEL: 2.4 ug/m^3.
Silica	A suspected carcinogen emitted from surface preparation and coating operations. Exposure through inhalation of dust. Screening URF of 2.9×10^{-4}. Acute AEL: none. Chronic AEL: none.
Styrene	A suspected carcinogen emitted from epoxy fabrication operations. Exposure through inhalation of vapors. URF of 5.7×10^{-7}. Acute AEL: none. Chronic exposure may cause irritation to skin, eyes, nose and throat. Chronic AEL: 700 ug/m^3.

4.0 Exposure Assessment

An exposure assessment is performed to estimate public exposure to a given chemical. This includes quantifying emissions from specific processes and devices, determining release parameters, modeling atmospheric effects or stack emissions, and determining routes of exposure. Procedures for performing the exposure assessment are specified in the CAPCOA Air Toxics "Hot Spots" Program and Risk Assessment Guidelines, January 1991, and the SCAQMD Supplemental Guidelines for Preparing Risk Assessments to comply with the Air Toxics "Hot Spots" Information and Assessment Act of 1987.

214-1

4.1 Scope of Study

As discussed in Section 2.0, the Northrop Pico Rivera facility is very complex with numerous processes and devices. A thorough inventory of AB2588 emissions was performed according to the AB2588 Emission Inventory Criteria and Guidelines Regulation. These guidelines required quantification of all releases regardless of the magnitude. The inventory report quantified emissions of 52 AB2588 compounds many of which were released in small amounts. After discussions with the SCAQMD it was decided that all processes should be studied to some degree but the refined risk assessment should focus on compounds with the greatest potential impacts.

A screening health risk assessment (SRA) was performed to ascertain

the level of study necessary for the Pico Rivera facility. The SRA was performed using the SCREEN dispersion model with emissions and release data from the AB2588 Emission Inventory Report.

Maximum potential health impacts were estimated using the highest off-site pollutant concentrations and DHS health effects data from the CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines. Use of the SCREEN model, with downwash option when applicable, is generally considered to provide conservative estimates of ambient concentrations (CAPCOA Air Toxics Assessment Manual, December 1990).

214-1

These results, together with the DHS health effects data, are used to characterize the maximum possible health impact from each process and contaminant emitted from the facility. Any further study using more refined dispersion modeling and exposure data will result in lower risk estimates.

Each stack was modeled using a normalized emission rate of one pound per hour. Individual pollutant concentrations are calculated using the emission rate and maximum ground level concentration predicted to occur at or beyond the facility property line. Stacks were sited using facility diagrams and information gathered using facility

surveys. The maximum hourly concentration predicted by the SCREEN model was multiplied by 0.1 to conservatively estimate annual average concentrations (CAPCOA Air Toxics Assessment Manual December 1990).

The predicted fenceline excess inhalation cancer risk, non-cancer acute health risk, and non-cancer chronic health risks are very small for most devices and pollutants. Based on screening results it was proposed that pollutants with insignificant impacts be omitted from further analysis in the risk assessment.

Insignificant impacts are defined as follows:

* **Carcinogenic impact**- AB2588 compounds with potential carcinogenic health risks were eliminated from further study if the fenceline excess cancer risk is less than five in one hundred million.

* **Noncancer impacts** - AB2588 compounds with potential non-cancer impacts were eliminated from further study if the cumulative health hazard index of all target organs is less than 0.01 for chronic effects and 0.1 for acute effects.

Screening fenceline health risk estimates for insignificant compounds are summarized in Table 4 of Appendix D. These compounds were not considered for further study in the refined health risk assessment.

Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

Stack#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
93001	*Chromium +6	4.420E-03	1.470E-05	1.009E-06
93004	Methyl Chloroform	8.591E+02	6.344E-01	1.961E-01
93006	*Chromium +6	2.546E-01	1.386E-02	5.812E-05
93006	Benzene	1.060E-02	5.000E-07	2.420E-06
93006	Formaldehyde	3.480E-03	1.800E-06	7.946E-07
93006	Methyl Chloroform	5.298E+01	1.587E+01	1.210E-02
93006	Styrene	8.319E-02	1.763E-02	1.899E-05
93011	Benzene	4.583E+00	2.780E-03	1.046E-03
93011	Formaldehyde	4.581E+00	2.780E-03	1.046E-03
93012	Benzene	8.795E-01	5.344E-04	2.008E-04
93012	Formaldehyde	2.890E+00	1.754E-03	6.598E-04
93013	Benzene	4.583E+00	2.780E-03	1.046E-03
93013	Formaldehyde	4.583E+00	2.780E-03	1.046E-03
93014	Benzene	4.583E+00	2.780E-03	1.046E-03
93014	Formaldehyde	4.583E+00	2.780E-03	1.046E-03
93017	Benzene	3.859E-02	6.100E-05	8.810E-06
93017	Formaldehyde	1.310E-01	2.000E-04	2.990E-05
93018	Benzene	5.413E-01	2.819E-04	1.236E-04
93018	Formaldehyde	1.776E+00	9.250E-04	4.054E-04
93019	Benzene	1.749E-01	3.316E-04	3.994E-05
93019	Formaldehyde	5.740E-01	1.088E-03	1.311E-04
93020	Formaldehyde	1.773E+00	2.000E-03	4.048E-04
93021	Benzene	8.269E-01	4.306E-04	1.888E-04
93021	Formaldehyde	2.714E+00	1.430E-05	6.196E-04
93022	Benzene	8.997E-02	1.015E-04	2.054E-05
93022	Formaldehyde	2.952E-01	3.330E-04	6.740E-05
93023	Benzene	1.537E+00	1.833E-03	3.510E-04
93023	Formaldehyde	2.714E+00	1.430E-04	6.196E-04
93024	Benzene	7.901E-02	4.120E-05	1.804E-05
93024	Formaldehyde	2.593E-01	1.350E-04	5.920E-05
93025	Benzene	2.195E+00	1.143E-03	5.012E-04
93025	Formaldehyde	7.202E+00	3.750E-03	1.644E-03
93026	Benzene	2.190E+00	1.100E-03	5.000E-04
93026	Formaldehyde	7.200E+00	3.800E-03	1.644E-03
93027	Benzene	9.417E-01	5.102E-04	2.150E-04
93027	Formaldehyde	3.091E+00	1.674E-03	7.058E-04
93031	Benzene	9.189E-01	4.785E-04	2.098E-04
93031	Formaldehyde	3.015E+00	1.570E-03	6.884E-04
93033	Benzene	2.157E-01	2.621E-04	4.924E-05
93033	Formaldehyde	7.078E-01	8.599E-04	1.616E-04
93036	Benzene	2.247E-01	3.276E-04	5.130E-05
93036	Formaldehyde	7.373E-01	1.075E-03	1.683E-04

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Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

Stack#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
93037	Benzene	8.545E-01	4.450E-04	1.951E-04
93037	Formaldehyde	2.803E+00	1.460E-03	6.400E-04
93039	*Chromium +6	4.617E+00	1.703E+00	1.054E-03
93039	1,4 Dioxane	0.000E+00	0.000E+00	0.000E+00
93039	Isocyanate	1.958E-02	9.790E-03	4.470E-06
93039	Methyl Chloroform	7.170E+02	4.006E+01	1.637E-01
93039	Nickel	5.950E-01	2.590E-01	1.358E-04
93039	Silica, Crystaline	5.376E+00	3.705E-01	1.227E-03
93039	Styrene	8.625E+02	4.870E+01	1.969E-01
93040	*Chromium +6	1.190E-02	1.910E-03	2.716E-06
93040	4,4 Meth Dianiline	1.088E-02	2.810E-03	2.484E-06
93040	Styrene	9.461E+00	4.116E+00	2.160E-03
93041	*Chromium +6	4.030E-02	4.780E-03	9.200E-06
93041	Isocyanate	2.070E+00	2.646E-01	4.726E-04
93041	Silica, Crystaline	6.001E-05	4.000E-05	1.370E-08
93042	*Chromium +6	2.470E-01	2.960E-02	5.640E-05
93042	*Lead	1.226E-01	4.082E-02	2.800E-05
93042	Isocyanate	1.557E+00	5.637E-01	3.554E-04
93042	Methyl Chloroform	3.369E+00	1.750E+00	7.692E-04
93042	Styrene	2.526E-01	5.004E-02	5.768E-05
93043	*Chromium +6	2.584E-01	6.180E-03	5.900E-05
93043	4,4 Meth Dianiline	2.790E+00	2.997E-01	6.370E-04
93043	Formaldehyde	1.332E+00	3.125E-02	3.040E-04
93044	*Chromium +6	7.100E-03	2.835E-03	1.621E-06
93044	4,4 Meth Dianiline	1.384E+00	1.249E+00	3.160E-04
93044	Benzene	4.120E-02	4.170E-03	9.406E-06
93044	Formaldehyde	3.127E-02	1.191E-02	7.140E-06
93044	Silica, Crystaline	8.234E-02	8.340E-02	1.880E-05
93045	Nickel	3.472E+01	5.865E-01	7.926E-03
93050	Methyl Chloroform	8.194E+02	4.229E+00	1.871E-01
93053	Methyl Chloroform	8.607E+04	1.057E+01	1.965E+01
93088	Benzene	8.366E-03	1.524E-03	1.910E-06
93088	Formaldehyde	2.747E-02	5.000E-03	6.272E-06
93089	Benzene	2.508E+00	1.524E-03	5.726E-04
93089	Formaldehyde	8.230E+00	5.000E-03	1.879E-03
93090	Benzene	2.508E+00	1.524E-03	5.726E-04
93090	Formaldehyde	8.230E+00	5.000E-03	1.879E-03
93091	Benzene	2.508E+00	1.524E-03	5.726E-04
93091	Formaldehyde	8.230E+00	5.000E-03	1.879E-03
93092	Benzene	6.700E-04	3.048E-04	1.530E-07
93092	Formaldehyde	2.190E-03	1.000E-03	5.000E-07
93093	Benzene	1.312E+00	1.990E-03	2.996E-04

Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

Stack#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
93093	Formaldehyde	4.305E+00	6.528E-03	9.829E-04
93094	Benzene	3.344E-01	2.538E-03	7.634E-05
93094	Formaldehyde	1.098E+00	8.000E-03	2.506E-04
93095	Benzene	1.045E+00	2.538E-03	2.386E-04
93095	Formaldehyde	3.430E+00	5.000E-03	7.830E-04
93096	Benzene	1.463E+00	1.524E-03	3.340E-04
93096	Formaldehyde	4.800E+00	5.000E-03	1.096E-03
93097	Benzene	3.700E-04	1.067E-04	8.448E-08
93097	Formaldehyde	1.230E-03	3.500E-03	2.808E-07
93098	Benzene	1.340E-02	6.095E-04	3.060E-06
93098	Formaldehyde	4.396E-02	2.000E-03	1.004E-05
93227	*Chromium +6	3.361E-03	1.870E-05	7.674E-07
93332	*Arsenic	6.600E-03	2.640E-04	1.507E-06
93332	*Chromium +6	6.000E-05	2.200E-06	1.370E-08
93332	*Lead	1.080E-03	4.320E-05	2.466E-07
93332	Benzene	2.220E-01	8.880E-03	5.068E-05
93332	Butadiene	7.800E-01	3.120E-02	1.781E-04
93332	Formaldehyde	2.002E+00	8.448E-02	4.570E-04
93332	Nickel	3.030E-03	1.212E-04	6.918E-07
93333	*Arsenic	6.600E-03	2.640E-04	1.507E-06
93333	*Chromium +6	6.000E-05	2.200E-06	1.370E-08
93333	*Lead	1.080E-03	4.320E-05	2.466E-07
93333	Benzene	2.220E-01	8.880E-03	5.068E-05
93333	Butadiene	7.800E-01	3.120E-02	1.781E-04
93333	Formaldehyde	2.002E+00	8.448E-02	4.570E-04
93333	Nickel	3.030E-03	1.212E-04	6.918E-07
93385	*Arsenic	7.150E-01	4.400E-04	1.632E-04
93385	*Chromium +6	1.000E-05	3.700E-05	2.284E-09
93385	*Lead	1.170E-03	7.200E-05	2.672E-07
93385	Benzene	2.405E-01	1.480E-02	5.490E-05
93385	Butadiene	8.450E-01	5.230E-02	1.929E-04
93385	Formaldehyde	2.288E+00	1.408E-01	5.224E-04
93385	Nickel	3.280E-03	2.020E-04	7.488E-07
93386	*Arsenic	5.770E-03	3.120E-02	1.317E-06
93386	*Chromium +6	5.000E-05	2.200E-06	1.142E-08
93386	*Lead	9.399E-04	4.320E-05	2.146E-07
93386	Benzene	1.942E-01	8.880E-03	4.434E-05
93386	Butadiene	6.824E-01	3.120E-02	1.558E-04
93386	Formaldehyde	1.848E+00	8.448E-02	4.220E-04
93386	Nickel	2.650E-03	1.212E-04	6.050E-07
93387	*Arsenic	1.091E-02	9.900E-04	2.491E-06
93387	*Chromium +6	9.000E-05	8.400E-06	2.055E-08

Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

Stack#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
93387	*Lead	1.780E-03	1.620E-04	4.064E-07
93387	Benzene	3.669E-02	3.330E-02	8.377E-06
93387	Butadiene	1.289E+00	1.170E-01	2.944E-04
93387	Formaldehyde	3.491E+00	3.168E-02	7.969E-04
93387	Nickel	5.010E-03	4.545E-04	1.144E-06
93388	*Arsenic	6.097E-03	3.120E-02	1.392E-06
93388	*Chromium +6	5.000E-05	2.200E-06	1.142E-08
93388	*Lead	1.000E-03	4.320E-05	2.284E-07
93388	Benzene	2.051E-01	2.640E-04	4.682E-05
93388	Butadiene	7.204E-01	8.600E-06	1.645E-04
93388	Formaldehyde	1.951E+00	8.448E-02	4.454E-04
93388	Nickel	2.800E-03	1.212E-04	6.392E-07
93392	*Lead	1.305E-01	6.259E-02	2.980E-05
93392	Methyl Chloroform	2.654E-01	2.976E-02	6.060E-05
93392	Silica, Crystaline	3.040E-02	1.460E-02	6.940E-06
93420	*Chromium +6	2.810E-03	1.742E-03	6.416E-07
93420	Isocyanate	2.110E+00	3.748E-01	4.818E-04
93421	*Chromium +6	4.415E-02	2.857E-02	1.008E-05
93421	*Lead	3.190E-03	2.100E-03	7.284E-07
93421	Methyl Chloroform	2.544E+01	1.094E+00	5.808E-03
93421	Nickel	2.493E+00	3.840E-01	5.692E-04
93421	Silica Crystaline	7.390E-03	3.904E-02	1.687E-06
93500	*Chromium +6	5.500E-03	3.485E-04	1.256E-06
93500	*Lead	1.997E-05	6.700E-06	4.560E-09
93500	Benzene	2.000E-05	5.000E-06	4.566E-09
93500	Isocyanate	5.387E+00	2.140E+00	1.230E-03
93500	Methyl Chloroform	3.084E+01	9.844E-01	7.040E-03
93500	Silica, Crystaline	1.660E-02	4.400E-03	3.790E-06
93501	*Chromium +6	4.238E-01	2.999E-02	9.676E-05
93501	4,4 Meth Dianiline	0.000E+00	0.000E+00	0.000E+00
93501	Isocyanate	6.605E+01	4.566E+00	1.508E-02
93501	Silica, Crystaline	1.763E+00	2.220E-01	4.024E-04
93505	Benzene	7.437E+02	2.656E+00	1.698E-01
93505	Butadiene	1.323E-01	4.725E-04	3.020E-05
93505	Formaldehyde	7.345E+03	2.623E+01	1.677E+00
93505	Styrene	2.878E-02	1.028E-04	6.570E-06
93506	*Chromium +6	4.845E-01	6.505E-02	1.106E-04
93506	*Lead	3.530E-03	3.421E-03	8.059E-07
93506	Isocyanate	2.193E+01	2.532E+00	5.006E-03
93506	Methyl Chloroform	1.424E+00	5.564E-01	3.252E-04
93506	Silica, Crystaline	3.640E-03	3.044E-03	8.311E-07
93508	*Chromium +6	1.169E+00	2.145E-03	2.668E-0[illegible]

Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

Stack#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
93508	1,4 Dioxane	1.798E-01	1.303E-03	4.106E-05
93508	4,4 Meth Dianiline	4.304E-02	4.720E-05	9.826E-06
93508	Benzene	4.319E+00	4.906E-03	9.860E-04
93508	Formaldehyde	2.679E+02	4.143E-01	6.116E-02
93508	Isocyanate	1.435E-02	5.540E-05	3.276E-06
93508	Methyl Chloroform	3.255E+03	3.344E+00	7.432E-01
93508	Silica, Crystaline	3.516E-01	9.100E-04	8.026E-05
93508	Styrene	1.051E+03	1.503E+00	2.399E-01
93509	*Chromium +6	8.935E-02	5.497E-03	2.040E-05
93509	1,4 Dioxane	7.140E-03	1.303E-03	1.630E-06
93509	4,4 Meth Dianiline	1.720E-03	4.720E-05	3.928E-07
93509	Benzene	1.642E+00	4.540E-02	3.748E-04
93509	Formaldehyde	1.072E+01	4.144E-01	2.448E-03
93509	Isocyanate	5.700E-04	5.540E-05	1.301E-07
93509	Methyl Chloroform	5.580E+01	1.319E+00	1.274E-02
93509	Silica, Crystaline	1.4[illegible]-02	9.100E-04	3.212E-06
93509	Styrene	4.203E+01	1.503E+00	9.596E-03
93015&16	Benzene	2.048E+00	1.067E-03	4.676E-04
93015&16	Formaldehyde	6.722E+00	3.500E-03	1.535E-03
Heatlt1k	Benzene	1.318E-01	5.869E-04	3.010E-05
Heatlt1k	Formaldehyde	3.174E-01	1.920E-03	7.246E-05
Ht1kto5k	Benzene	1.948E+00	8.517E-03	4.448E-04
Ht1kto5k	Formaldehyde	6.406E+00	3.710E-02	1.463E-03
Ht5kto1m	Benzene	4.106E-01	2.307E-03	9.374E-05
Ht5kto1m	Formaldehyde	1.347E+00	7.570E-03	3.076E-04
Htgrt1m	Benzene	4.181E-01	5.943E-03	9.546E-05
Htgt1m	Formaldehyde	1.372E+00	1.950E-02	3.132E-04
Iccfug	*Chromium +6	1.026E+00	1.171E-04	2.342E-04
Iccfug	4,4 Meth Dianiline	2.199E-03	7.000E-03	5.020E-07
Iccfug	Isocyanate	3.520E+00	8.820E-01	8.036E-04
Iccfug	Methyl Chloroform	3.784E+02	1.268E+01	8.640E-02
Iccfug	Styrene	5.850E-01	4.430E-01	1.336E-04
Nt053fug	*Chromium +6	2.462E+00	6.980E-02	5.620E-04
Nt053fug	1,4 Dioxane	7.450E+00	9.187E-02	1.701E-03
Nt053fug	Methyl Chloroform	2.400E+03	3.010E+00	5.480E-01
Ntavafug	4,4 Meth Dianiline	6.999E-03	2.205E-03	1.598E-06
Ntenvfug	Methyl Chloroform	1.734E-02	3.125E-03	3.960E-06
Ntewsfug	Formaldehyde	4.965E-01	1.178E-02	1.134E-04
Ntewsfug	Methyl Chloroform	1.031E+01	7.018E+00	2.354E-03
Ntfltfug	*Chromium +6	2.321E-01	5.264E-03	5.300E-05
Ntfltfug	1,4 Dioxane	7.740E-01	7.045E-01	1.767E-04
Ntfltfug	Methyl Chloroform	2.394E+01	2.794E+01	5.466E-03

Table 4
NORTHROP B2 DIVISION- REFINED HEALTH RISK ASSESSMENT
EMISSION SUMMARY BY STACK

St ck#	Compounds	Emissions		
		lbs/yr	lbs/hr 1 Hr Maximum	lbs/hr Annual Average
Ntfltfug	Styrene	1.401E+00	1.599E-04	3.198E-04
Ntgp2fug	*Chromium +6	6.552E-01	4.091E-02	1.496E-04
Ntgp2fug	Isocyanate	1.086E+01	1.890E-01	2.480E-03
Ntgp2fug	Styrene	1.025E+02	6.405E+00	2.340E-02
Nthlbfug	Methyl Chloroform	5.416E-02	6.260E-03	1.237E-05
Nthlbfug	Styrene	2.999E-05	3.100E-06	6.848E-09
Ntlelfug	Methyl Chloroform	1.009E-03	2.006E-04	2.304E-07
Ntmdcfug	*Chromium +6	1.568E-02	3.620E-03	3.580E-06
Ntmdcfug	Methyl Chloroform	1.997E+02	8.508E+00	4.560E-02
Ntmdcfug	Styrene	3.101E+01	1.751E+00	7.080E-03
Ntplasf	Methyl Chloroform	2.744E+03	7.413E+00	6.264E-01
Ntplasf	Nickel	4.290E+00	3.120E-03	9.794E-04
Ntplstf	Benzene	2.152E-01	2.779E-03	4.914E-05
Ntplstf	Methyl Chloroform	3.532E+03	4.726E+00	8.064E-01
Ntplstf	Styrene	3.760E-03	1.375E-04	8.584E-07
Ntqafug	Methyl Chloroform	2.222E+00	1.187E-01	5.074E-04
Ntshpfug	Methyl Chloroform	2.116E+00	1.875E-01	4.830E-04
Nttmpfug	*Chromium +6	2.365E-01	3.200E-04	5.400E-05
Ntvibfug	*Chromium +6	1.770E-03	4.025E-04	4.040E-07

The total fenceline risk for all these compounds is less than three in ten million for carcinogenic risk, 0.03 HHI chronic non-cancer and 0.08 HHI acute non-cancer.

The following compounds were studied further in this refined health risk assessment.

Arsenic	1,3 Butadiene
Hexavalent Chromium	Formaldehyde
Lead Compounds	Isocyanate
4,4 Methylene Dianiline	Methyl Chloroform
1,4 Dioxane	Nickel
Benzene	Silica
Styrene	

214-1

Many devices emitting these compounds have fenceline cancer and non-cancer risks of less than one in one billion and 0.01, respectively. Elimination of these devices would provide a concise, yet accurate, AB2588 health risk assessment. However, in an effort to prevent confusion or perception of inadequacy, all devices emitting the above compounds were evaluated in the refined assessment.

4.2 Sources and Quantities of Emissions

Emission sources were identified through site surveys and reported in the AB2588 Emission Inventory Plan. A summary of devices and processes is included in Table 3.

Emissions from each process were quantified with procedures proposed in the AB2588 Emission Inventory Plan. Emissions were documented and reported in the AB2588 Emission Inventory Report submitted to the SCAQMD on January 13, 1991. Northrop is awaiting report approval by the SCAQMD. The SCAQMD has not requested additional information on the report. Emissions used in the risk assessment are shown in Table 4 for each chemical and stack.

Indirect emissions were allocated to appropriate exhaust locations according to the following criteria:

* **Direct Emissions** - Many devices are either emitted through dedicated exhaust stacks or through stacks shared with other devices. The Emission Inventory Report was reviewed for release data and preliminary emissions allocation. Stack heights, diameters, locations, flow rates, and temperatures were verified during subsequent site surveys. Stack and emissions data are reported on AB2588 STK forms.

* **Fugitive Emissions** - Fugitive or indirect emissions were allocated on a case-by-case basis. Most emitting devices without stacks are located in rooms or buildings with doors which remain closed for reasons of security or environmental control. For these devices, emissions were allocated to HVAC systems or open exhaust apparatus (i.e. vented hoods, lip exhaust, etc.) adjacent to the device.

4.3 Exposure Scenarios

Potential health impacts were evaluated under two exposure scenarios: chronic exposure to average facility impacts over many years and acute exposure to peak one hour facility impacts. Results from either scenario are health protective because ambient concentrations attributable to facility emissions are estimated with dispersion modeling using worst case meteorological scenarios. Separate model runs were performed for each exposure scenario using the following emissions information:

214-1

* **Annual Average Emissions** - ambient concentrations for chronic exposure scenarios are based on average annual emission rates. The average annual emission rate is calculated by dividing total annual emissions by typical facility operating hours. Operating hours at the Pico Rivera facility occur during staggered shifts that range from 5:30AM to 5:00PM. This approach for calculating average emission rates is outlined in the CAPCOA Air Toxics Assessment Manual and appropriate given that chronic health impact data is based on doses received over long (70 years for cancer potency) exposure periods.

* **Maximum Hourly Emissions** - ambient concentrations for acute exposure scenarios are based on maximum hourly emission rates. The maximum hourly emission rate is reported in the facility AB2588 Emission Inventory Report.

Average annual concentrations were calculated for all chemicals. Maximum one hour concentrations were calculated for lead and formaldehyde. An average annual concentration based on maximum hourly emissions was also calculated for lead.

Potential non-cancer effects of chronic (long-term) exposures were studied by assuming that individuals are continuously exposed to average ambient pollutant concentrations attributable to facility emissions. Potential carcinogenic health impacts from chronic exposure were evaluated under three exposure scenarios:

* **Maximum Possible Exposure (MPE)** - The MPE is a hypothetical exposure scenario where an individual is continuously exposed to the highest off site annual average pollutant concentrations. For a residential MPE, a 70 year exposure period of 24 hrs/day, 365 days/year is assumed. For offsite worker/occupational MPE, a 40 year exposure period of 9 hours/day, 260 days/year is assumed.

  It is acknowledged that the MPE exposure scenario is very unrealistic and will overestimate any potential exposure to facility emissions. However, the MPE risk estimate, which is analogous to the widely used maximum exposed individual scenario, is required by the Department of Health Services and may be useful when comparing the relative potential health risks posed by various types of facilities throughout the state. The MPE exposure scenario is also specified in the CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines.

* **Maximum Plausible Exposure** - This scenario was evaluated to provide a more realistic, yet still conservative (health protective) estimates of maximum potential exposure. Maximum plausible residential exposure is a continuous exposure to receptor specific pollutant concentration over 30 years. For the maximum plausible occupational exposure, an exposure period of 9 hrs/day, 260 days/year, for 30 years is assumed.

214-1

* **Most Reasonable Exposure** - This scenario was evaluated to provide an exposure estimate familiar to most individuals. The most reasonable residential exposure is a 17 hr/day, 365 days/year, 9 year exposure to receptor specific ambient concentration. For the most reasonable occupational exposure, an exposure period of 9 hrs/day, 260 days/year, for 9 years is assumed.

The maximum plausible and most reasonable scenarios are based on statistical studies of population mobility for various urban regions of the United States (U.S. EPA Office of Exposure Assessment, Exposure Factors Handbook, 1989). These additional exposure scenarios have been used by the EPA to assess potential impacts from hazardous waste sites slated for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund).

As per guidance from the SCAQMD the potential carcinogenic risk from lead, isocyantes, and silica were not quantified. Ambient concentrations were calculated and are presented in Appendix C.

4.4 Exposure Pathways

The study area was evaluated and potential exposure pathways identified for each contaminant. All contaminants were evaluated for potential health impacts resulting from exposure by inhalation. Doses received by inhalation were calculated using assumptions listed in Table 5.

TABLE 5
EXPOSURE PARAMETERS

	Maximum Possible Exposure		Maximum Plausible Exposure		Most Reasonable Exposure	
Exposure Parameter	*Residential*	*Occupational*	*Residential*	*Occupational*	*Residential*	*Occupational*
Exposure Duration (Years)	70	46	30	30	9	9
Exposure Length (hrs./day)	24	8	24	9	17	9
Exposure Frequency (Days/Yr)	365	240	365	240	365	240
Average Body Weight (lbs)	155	155	155	155	155	155
Respiration Rate (cubic feet/hr)	29.4	29.4	29.4	29.4	29.4	29.4

Potential health impacts resulting from long-term exposure through non-inhalation pathways were evaluated for arsenic, chromium and lead (noncancer impacts only) as specified in the CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines. Algorithms in Appendix E of the CAPCOA guidelines were used to determine the environmental fate and exposure parameters for dermal exposure, homegrown crop ingestion, and soil ingestion.

214-1

Exposures through non-inhalation pathways were evaluated for each exposure scenario. Exposure through homegrown crop ingestion was not included under the maximum plausible and most reasonable scenarios.

A survey of the study area (see Section 4.6) indicates there is a single open reservoir five miles north of the facility. This exposure route was considered for water and fish ingestion (from recreational fishing) pathways under the maximum possible exposure scenario. There are no commercial agricultural, livestock or fishery operations in the study area.

Outputs of the non-inhalation pathway analysis are presented in Appendix A.

4.5 Dispersion Modeling Approach

Computer dispersion models used to predict ambient concentrations are specified in the CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines. 3E Company used the EPA approved ISCST dispersion models to determine groundlevel concentrations resulting from stack emissions.

The model was selected after consultation with the SCAQMD modeling staff and is appropriate given the simple terrain surrounding the facility. ISCST options used in the analysis are shown in Table 6. The Breezewake program from Trinity Consultants was used to evaluate potential downwash effects for each exhaust stack and building.

Fine receptor cartesian grid densities of 75 to 100 meters were used in the areas of maximum impacts as determined using screening modeling. Results of the screening analysis indicate that maximum off site impacts occur near the facility property line (see Appendix D). Course density grids (1000 meters) were used in remaining portions of the study area for calculating isopleths. Grid spacings of 75, 100 and 1000 meters were used for chromium because of its large contribution to potential impacts and for acute pollutants - lead and formaldehyde.

214-1

Table 6

NORTHROP B- 2 DIVISION

ISCST Model Input Options

SW	DESCRIPTION	Value Definitions 0	1	2	3	4	Proposed Switches
ISW(1)	Calculate	N/A	Concentration	Deposition	N/A	N/A	1
ISW(2)	Receptor Grid System	N/A	Rectangular	Polar	Rectangular	Polar	1
ISW(3)	Discrete Receptor System	N/A	Rectangular	Polar	N/A	N/A	1
ISW(4)	Terrain Elevations are Read	No	Yes	N/A	N/A	N/A	0
ISW(5)	Calculations are written to tape	No	Yes	N/A	N/A	N/A	1
ISW(6)	List all input data	No	Yes	Met Data Also	N/A	N/A	1
ISW(7)	Compute Hourly Average Concentration	No	Yes	N/A	N/A	N/A	1
ISW(8)	Compute 2-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(9)	Compute 3-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(10)	Compute 4-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(11)	Compute 6-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(12)	Compute 8-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(13)	Compute 12-Hour Average Concentration	No	Yes	N/A	N/A	N/A	0
ISW(14)	Compute 24-Hour Average Concentration	No	Yes	N/A	N/A	N/A	1
ISW(15)	Print In-Day tables(s)	No	Yes	N/A	N/A	N/A	1
ISW(16)	Print Daily table	No	Yes	N/A	N/A	N/A	0
ISW(17)	Print Highest & Second highest tables	No	Yes	N/A	N/A	N/A	0
ISW(18)	Print maximum 50 tables	No	Yes	N/A	N/A	N/A	0
ISW(19)	Meteorological data input method	N/A	Pre-processed	Card	N/A	N/A	1
ISW(20)	Rural-Urban option	Rural	Urban Mode 1	Urban Mode 2	Urban Mode 3	N/A	0
ISW(21)	Wind profile exponent values	N/A	Defaults	User Enters	User Enters	N/A	1
ISW(22)	Vertical potential temperature gradient values	N/A	Defaults	User Enters	User Enters	N/A	1
ISW(23)	Scale emissions rates for all sources	No	Yes is > 0	N/A	N/A	N/A	0
ISW(24)	Program calculates final plume rise only	N/A	Yes	No	N/A	N/A	2
ISW(25)	Program adjusts all stack heights for downwash	N/A	No	Yes	N/A	N/A	2
ISW(26)	Program uses buyancy-induced dispersion	N/A	Yes	No	N/A	N/A	1
ISW(27)	Program uses calm wind routine during calm periods	N/A	Yes	No	N/A	N/A	1
ISW(28)	Program sets Regulatory default features	N/A	Yes	No	N/A	N/A	1
ISW(29)	Program assumes SO2 is being modeled	N/A	Yes	No	N/A	N/A	2
ISW(30)	Program uses an input debug mode	N/A	Yes	No	N/A	N/A	2
ISW(31)	Input flagpole receptor heights	No	Yes	N/A	N/A	N/A	0
NGROUP	Number of source groups	N/A	N/A	N/A	N/A	N/A	Optional
IPERD	Time period interval to be printed	All Intervals	N/A	N/A	N/A	N/A	0
TK	Source emission rate units conversion factor	Values do not apply - enter a number					1.00E+06
BETA1	Entrainment coefficient for Unstable atmosphere	Values do not apply - enter a number					0.6
BETA2	Entrainment coefficient for Stable atmosphere	Values do not apply - enter a number					0.6
ZR	Height above ground at which wind speed was measur	Values do not apply - enter a number					10
IMET	Logical unit number of meteorological data	Values do not apply - enter a number					5
DECAY	Decay coefficient	Default	N/A	N/A	N/A	N/A	0
G	Acceleration due to gravity	Default	N/A	N/A	N/A	N/A	0
QFLG	Source emission option	Default	N/A	N/A	N/A	N/A	0
UCATS	Wind speed categories	Default	N/A	N/A	N/A	N/A	0

NTISCST.XLS

Meteorological data for refined dispersion models were obtained from the SCAQMD on March 21, 1991. This data supplied by the SCAQMD was processed using wind direction and wind speed from the District's wind monitoring station. Surface meteorological parameters were recorded at the Pico Rivera Wind Station, the Long Beach Surface Station, and the mixing height was obtained from LAX. The information was recorded in 1981.

214-1

Results and inputs to the dispersion modeling are presented in Appendix C. Maps showing isopletns and study area are in Appendix F.

4.6 Zone of Impact

The zone of impact or study area is determined using results of the dispersion modeling to calculate chemical concentrations and cumulative impacts. Consistent with the SCAQMD Supplemental Guidelines for Preparing Risk Assessments to Comply with the Air Toxics "Hot Spots" and Information Act, the study area focused on those areas with greatest concentrations and potential risk. This area extends approximately five miles from the Pico Rivera facility (see map in Appendix F). This study area is appropriate given the limitations associated with dispersion models in calculating very low pollutant concentrations.

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The receptors of interest were plotted and grouped according to census tract. A complete listing of receptors and their corresponding census tract location is provided in Appendix F.

As per guidance from the SCAQMD, Northrop is performing an alternative risk characterization study of facility impacts without chromium emissions from painting operation. This additional study is appropriate, given the uncertainty associated with the bioavailability of these chromium emissions. Further guidance from DHS is pending.

214-1

5.0 Risk Characterization

Risk characterization is the final step in the risk assessment process where hazard assessment data is combined with results of the exposure assessment to calculate cumulative impacts from all facility emissions. Risk characterization is presented in two categories: potential carcinogenic risks and potential non-carcinogenic risks.

5.1 Potential Carcinogenic Risk

Risks from chemicals suspected to cause cancer in animals or humans are known as "excess cancer risks". These risks are expressed as probabilities that one may contract a disease because of exposure to a given chemical. Probability is expressed on a scale of zero to one with zero probability representing no chance of disease.

The probability of contracting a disease or excess cancer is usually so small that for convenience purposed results are presented in exponential notation. For instance, an excess cancer risk value of 1×10^{-5} indicates one chance in one hundred thousand.

Results of the dispersion modeling indicates the point of maximum impact occurs within the facility fencelines. The point of maximum impact which occurs beyond the facility fenceline at a residential area is located 70 meters northeast of the facility

(receptor #, X = 398630, Y = 3760800). The potential excess cancer risk at this location of maximum impact is presented in Table 7, 8, and 9. The maximum impact at an occupational area occurs 90 meters east northeast of the facility (receptor #, X = 398600, Y = 3760750). The potential excess cancer risk at this location of maximum impact is presented in Tables 10, 11, and 12.

The average potential residential risk is a population weighted risk based on the potential excess cancer risk at each census tract centroid and corresponding residential population. The average residential risk is presented for each exposure scenario in Table 13. The potential excess cancer burden for the study area is also based on the potential risk at each census centroid and respective residential populations. The potential excess burden for each exposure scenario is presented in Appendix F. A map showing risk isopleths is presented in Appendix E. The total residential population within the one in one million maximum possible risk isopleth is estimated at 248,416. The estimated residential population within the one in one hundred thousand isopleths is 19,487.

5.2 Potential Noncancer Impacts

Noncancer risks are expressed as health hazard indices and are not probabilities. The hazard index of a given chemical is the ratio of the potential intake of a chemical to the acceptable exposure limit (AEL) established by the Department of Health Services. AEL's are applicable to all members of the public including children or infirmed individuals. AEL's are presented for each chemical in Section 3.0.

Table 7

Potential Carcinogenic Risk Maximum Reasonable Residential Exposure						
Pollutant	Carcinogenic Risk (x 10-5)					
	Inhalation	Dermal Exposure	Crop Ingestion	Soil Ingestion	Others	Total
Arsenic	0.00095	0.00003	N/A	0.0019	N/A	0.00288
Benzene	0.0074	N/A	N/A	N/A	N/A	0.0074
1,3 Butadiene	0.00053	N/A	N/A	N/A	N/A	0.00053
Dioxane	0.000021	N/A	N/A	N/A	N/A	0.000021
Formaldehyde	0.0317	N/A	N/A	N/A	N/A	0.0317
Hex. Chromium	0.672	0.05	N/A	0.035	N/A	0.757
4,4 Methyl Dianiline	0.000001	N/A	N/A	N/A	N/A	0.000001
Nickel	0.0019	N/A	N/A	N/A	N/A	0.0019
Styrene	0.00042	N/A	N/A	N/A	N/A	0.00042
Sub Total	0.714922	0.05003	0	0.0369	0	0.801852

214-1

Table 8

Potential Carcinogenic Risk Maximum Plausible Residential Exposure						
Pollutant	**Carcinogenic Risk (x 10-5)**					
	Inhalation	**Dermal Exposure**	**Crop Ingestion**	**Soil Ingestion**	**Other**	**Total**
Arsenic	0.004	0.00013	N/A	0.0077	N/A	0.01183
Benzene	0.03	N/A	N/A	N/A	N/A	0.03
1,3 Butadiene	0.0022	N/A	N/A	N/A	N/A	0.0022
1,4 Dioxane	0.00009	N/A	N/A	N/A	N/A	0.00009
Formaldehyde	0.134	N/A	N/A	N/A	N/A	0.134
Hex. Chromium	2.752	0.215	N/A	0.14	N/A	3.107
4,4 Methyl Dianiline	0.00004	N/A	N/A	N/A	N/A	0.00004
Nickel	0.0077	N/A	N/A	N/A	N/A	0.0077
Styrene	0.0017	N/A	N/A	N/A	N/A	0.0017
Sub Total	**2.93173**	**0.21513**	**0**	**0.1477**	**0**	**3.29456**

214-1

Table 9

Potential Carcinogenic Risk Maximum Possible Residential Exposure						
Pollutant	**Carcinogenic Risk (x 10-5)**					
	Inhalation	**Dermal Exposure**	**Crop Ingestion**	**Soil Ingestion**	**Fish/Water Ingestion**	**Total**
Arsenic	0.009	0.0003	0.004	0.018	0.0008	0.0321
Benzene	0.070	N/A	N/A	N/A	N/A	0.07
1,3 Butadiene	0.005	N/A	N/A	N/A	N/A	0.005
1,4 Dioxane	0.0002	N/A	N/A	N/A	N/A	0.0002
Formaldehyde	0.312	N/A	N/A	N/A	N/A	0.312
Hex. Chromium	6.40	0.50	1.55	0.33	0.0008	8.7808
4,4 Methyl Dianilin	0.00001	N/A	N/A	N/A	N/A	0.00001
Nickel	0.018	N/A	N/A	N/A	N/A	0.018
Styrene	0.004	N/A	N/A	N/A	N/A	0.004
Sub Total	**6.81821**	**0.5003**	**1.554**	**0.348**	**0.0016**	**9.22211**

214-1

Table 10

Potential Carcinogenic Risk Most Reasonable Occupational Exposure						
Pollutant	**Carcinogenic Risk (x 10-5)**					
	Inhalation	**Dermal Exposure**	**Crop Ingestion**	**Soil Ingestion**	**Others**	**Total**
Arsenic	0.0003	0.00001	N/A	0.0006	N/A	0.00091
Benzene	0.0019	N/A	N/A	N/A	N/A	0.0019
1,3 Butadiene	0.00018	N/A	N/A	N/A	N/A	0.00018
1,4 Dioxane	0.000005	N/A	N/A	N/A	N/A	0.000005
Formaldehyde	0.0084	N/A	N/A	N/A	N/A	0.0084
Hex. Chromium	0.214	0.017	N/A	0.011	N/A	0.242
4,4 Methyl Dianiline	0.000003	N/A	N/A	N/A	N/A	0.000003
Nickel	0.000074	N/A	N/A	N/A	N/A	0.000074
Styrene	0.00017	N/A	N/A	N/A	N/A	0.00017
Sub Total	**0.225032**	**0.01701**	**0**	**0.0116**	**0**	**0.253642**

Table 11

Potential Carcinogenic Risk Maximum Plausible Occupational Exposure						
Pollutant	Carcinogenic Risk (x 10-5)					
	Inhalation	Dermal Exposure	Crop Ingestion	Soil Ingestion	Others	Total
Arsenic	0.0011	0.00003	N/A	0.0021	N/A	0.00323
Benzene	0.0062	N/A	N/A	N/A	N/A	0.0062
1,3 Butadiene	0.0006	N/A	N/A	N/A	N/A	0.0006
1,4 Dioxane	0.00002	N/A	N/A	N/A	N/A	0.00002
Formaldehyde	0.0281	N/A	N/A	N/A	N/A	0.0281
Hex. Chromium	0.713	0.056	N/A	0.038	N/A	0.807
4,4 Methyl Dianiline	0.00001	N/A	N/A	N/A	N/A	0.00001
Nickel	0.0025	N/A	N/A	N/A	N/A	0.0025
Styrene	0.00056	N/A	N/A	N/A	N/A	0.00056
Sub Total	0.75209	0.05603	0	0.0401	0	0.84822

214-1

Table 12

Potential Carcinogenic Risk Maximum Possible Occupational Exposure						
Pollutant	Carcinogenic Risk (x 10-5)					
	Inhalation	Dermal Exposure	Crop Ingestion	Soil Ingestion	Fish/ Water Ingestion	Total
Arsenic	0.0014	0.00004	0.0007	0.0028	0.00012	0.00506
Benzene	0.0083	N/A	N/A	N/A	N/A	0.0083
1,3 Butadiene	0.0008	N/A	N/A	N/A	N/A	0.0008
1,4 Dioxane	0.00002	N/A	N/A	N/A	N/A	0.00002
Formaldehyde	0.0374	N/A	N/A	N/A	N/A	0.0374
Hex. Chromium	0.951	0.074	0.10	0.05	0.00012	1.17512
4,4 Methyl Dianiline	0.000015	N/A	N/A	N/A	N/A	0.000015
Nickel	0.0033	N/A	N/A	N/A	N/A	0.0033
Styrene	0.00075	N/A	N/A	N/A	N/A	0.00075
Sub Total	1.002985	0.07404	0.1007	0.0528	0.00024	1.230765

Table 13

Average Potential Residential Excess Cancer Risk

Exposure Scenario	Average Potential Residential Risk (1 x 10-5)
Most Reasonable	0.02
Maximum Plausible	0.06
Maximum Possible	0.14

214-1

Study area population of 701,418 includes all census tracts or portions thereof, located in the zone of impact. The zone of impact is defined by a circle ten miles in diameter (See Appendix E for map).

SIG...

Hazard ...

chem...

The point ...

locations ...

CV /REPR...

KIDNY

GI/LV

IMMUN

RESP.	-	Residential	X =	398800
			Y =	3760400
		Occupational	X =	398800
			Y =	3760400
CNS	-	Residential	X =	397600
			Y =	3760300
	-	Occupational	X =	397600
			Y =	3760300

214-1

Health hazard indices for chronic exposure are presented for each exposure and location in Tables 14 and 15.

Results of the dispersion modeling indicate the point of maximum potential acute noncancer impact occurs within the facility fencelines. The offsite point of maximum acute formaldehyde impact which occurs beyond the facility fenceline is located 25 meters north (receptor #, X = 398160, Y = 3761100). The point of maximum offsite acute lead impact occurs 50 meters northeast of the facility (receptor #, X = 398490, Y = 3760700).

The acute noncancer health hazard indices at these locations are presented in Table 16.

Table 14

Potential Chronic Noncancer Risk
Maximum Possible Occupational Exposure

Pollutant	Target Organ						
	CV	CNS	IMMUN	KIDN	GI/LV	REPRO	RESP
Benzene	0	<0.01	0	0	0	0	0
Formaldehyde	0	0	0	0.03578	0.1323	0	0.03578
Hex. Chromium	0	0	0	<0.01	0.001573	0	0.01
Lead	<0.01	<0.01	<0.01	<0.01	0	<0.01	0
Methyl Chloroform	0	0.01689	0	0	0.0075	0	0
Nickel	0	0	0.3846	0.3829	0	0	0.3829
Styrene	0	0	0	0	<0.01	0	0
Totals =	**<0.01**	**0.01689**	**0.3846**	**0.4208**	**0.1415**	**<0.01**	**0.4208**

Table 13

Potential Chronic Noncancer Risk
Maximum Possible Residential Exposure

Pollutant	Target Organ						
	CV	CNS	IMMUN	KIDN	GI/LV	REPRO	RESP
Benzene	0	<0.01	0	0	0	0	0
Formaldehyde	0	0	0	0.03578	0.1323	0	0.03578
Hex. Chromium	0	0	0	<0.01	0.001573	0	<0.01
Lead	<0.01	<0.01	<0.01	<0.01	0	<0.01	0
Methyl Chloroform	0	0.1689	0	0	0.0075	0	0
Nickel	0	0	0.3846	0.3829	0	0	0.3829
Styrene	0	0	0	0	<0.01	0	0
Totals =	**<0.01**	**0.01689**	**0.3846**	**0.4208**	**0.1415**	**<0.01**	**0.4208**

214-1

Table 16

Potential Acute Noncancer Risk

Exposure Scenario	Potential Acute Health Hazard Index	
	Formaldehyde	Lead (1)
Maximum Possible	2.3	0.032

(1) HHI based on maximum hourly lead emissions and annual average concentration. Maximum hourly concentration based on maximum hourly emissions would be 3.65 ug. per cubic meter.

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